

CHAPTER 28

Forestry Best Management Practices for Wetlands in Minnesota

Michael J. Phillips

CONTENTS

Introduction	403
BMP Development	404
BMP Guidelines	406
Planning Considerations.....	406
Forest Roads	406
Timber Harvesting	407
Pesticide Use	408
Prescribed Burning on or Adjacent to Wetlands	408
Discussion	408
References	409

INTRODUCTION

Wetlands are a common landscape feature in Minnesota in spite of significant losses of wetlands to agriculture and development. Prior to European settlement, Minnesota contained 7.5 million ha of wetlands, including both wet **mineral** and peat soils. These wetlands covered approximately 35 percent of the state. The current extent of wetlands for Minnesota is approximately 3 million ha, which represents a 60 percent loss of the original wetland acreage (Minnesota Department of Natural Resources, Protected Water Inventory Data Base, 1984). The majority of the remaining wetlands are found in the forested regions of Minnesota, predominantly located on county, state, and federal lands in northern Minnesota.

In recent years, the diminishing wetland resources and recognition of the important benefits that wetlands provide have generated much discussion and debate on the need to preserve and protect the nation's remaining wetlands. Wetlands management and protection have evolved into a major national and state policy issue (Siegel, 1991; Siegel and Haines, 1990). Although the policy debates on the issue have often been fractious and controversial, there is general agreement among natural resource professionals on the need to protect the functions and values of wetlands.

Recognizing the need to maintain or enhance the remaining wetland resource in Minnesota, a "no net loss" Wetland Conservation Act (WCA) was enacted into law in 1991 and amended in 1993. The WCA complements other wetland regulations, including Section 404 of the Clean Water Act. The 1977 amendments to the federal Clean Water Act [Section 404(f)] provided a permit exemption for normal forestry operations in wetland areas. A similar exemption was incorporated into the WCA of 1991. The use of Best Management Practices (**BMPs**) is encouraged in both acts to protect wetland values and functions. Best Management Practices provide resource managers, loggers, and landowners with the necessary tools to avoid or minimize direct and indirect impacts from activities that, if improperly conducted, can diminish the quantity, quality, and biological diversity of wetlands. With **BMPs** as an integral part of forest management, continuous commercial production on or near Minnesota's wetlands is feasible without compromising environmental quality.

BMP DEVELOPMENT

Best Management Practices have been developed in most states where forestry is a significant land use. As of 1992, 42 states had published **BMPs** for forest management (Boyette, 1993). Many of the state forestry organizations have provided the leadership in the development of **BMPs**, often in cooperation with other resource agencies, conservation groups, forest industry, and landowners. Best Management Practices serve as the cornerstone for the water quality and wetlands protection programs developed by the states. Development of these programs has been shaped by the particular physiographic, economic, technical, and political characteristics of each state.

Implementation of **BMPs** varies from nonregulatory or quasiregulatory (e.g., Minnesota, Virginia) to mandated compliance by state law (e.g., Oregon, Washington) (Ellefson et al., 1995; Floyd and MacLeod, 1993). Under a regulatory program, **BMPs** to protect water quality are legally binding with penalties for noncompliance. With a quasiregulatory program, **BMPs** are encouraged but not strictly required. However, if adverse impacts to water quality are found and **BMPs** were not used, then significant penalties may be assessed to the responsible party. Programs that are considered voluntary do not have the force of law to mandate compliance with **BMPs**, and there are no legal penalties for noncompliance. Instead these programs rely on the cooperation of loggers, landowners, and

resource managers to implement **BMPs**. Education, technical assistance, and financial incentives are critical to the success of voluntary programs.

Best Management Practices are preventative in nature and are often viewed as a surrogate for water quality standards. The use of **BMPs** is the preferred mechanism for controlling **nonpoint** source pollution for several reasons. Water quality standards do not take into account the natural variability that exists in forest streams. Water quality monitoring is expensive, and the limited resources of state agencies also make water quality monitoring problematic. Forestry activities often produce minor and short-term impacts that generally have little effect on long-term water quality where proper preventative practices are employed (Curtis et al., 1990; Lynch and Corbett, 1990). The proper function of water quality standards in forestry **nonpoint** source programs may be to test BMP effectiveness and provide data to fine tune BMP practices.

There are a number of key criteria that characterize development of effective **BMPs**. First and foremost, **BMPs** must embody the principle of prevention so that practices utilized will minimize impacts to water quality and wetlands. While prevention is fundamental to BMP selection, other considerations are also important. The **BMPs** must be reasonable and not excessive to what is required to provide protection to the resource. The ability to obtain logger, landowner, and resource manager cooperation in implementing **BMPs** will be enhanced if the BMP recommendations are perceived as not excessive. The **BMPs** must also achieve the identified goals for water quality and wetlands protection. The **BMPs** that are selected should be cost-effective. It will be easier to obtain logger, landowner, and resource manager commitment if the cost of implementing **BMPs** is reasonable. The **BMPs** must also be flexible so that they can be tailored to site-specific conditions. What is implementable on one site may not be appropriate under other site conditions. Finally, it is essential that the state's forestry **BMPs** be understood by loggers, landowners, and resource managers.

When the decision was made to move forward with wetland BMP development for forestry in Minnesota, it was recognized that successful implementation of these **BMPs** would be dependent on obtaining the involvement and commitment of the agencies and organizations with an interest in forestry wetland issues. A forestry wetland BMP task force was established with representatives from federal and state agencies, county government, forest industry, environmental organizations, logging interests, and private landowner groups. The integrated team approach was essential to the success of this effort. Wetland issues continue to be controversial, and finding common ground requires inclusive partnerships that represent the broad range of interests and opinions. The range of organizations represented on the task force generated intense debate and, eventually, compromise and consensus. The results of this effort have been published in a revised water quality and wetlands protection guidebook (Minnesota Department of Natural Resources, Division of Forestry, 1995). The wetland **BMPs** in the guidebook provide recommendations for road construction and maintenance, timber harvesting, site preparation, pesticide use, and prescribed burning.

BMP GUIDELINES

The principal outcome from applying Minnesota's wetland **BMPs** will be the protection of normal water movement within the wetland. The assumption is that applying practices that maintain hydrological flows will protect other wetland functions as well. Protecting hydrological flows on wetlands means minimizing the depth and extent of rutting. Practices that minimize the depth and extent of rutting provide the basis for many of the BMP recommendations and will supplement upland forestry **BMPs** to protect water quality. The practices listed below represent selected wetland **BMPs** that have been adopted for Minnesota.

Planning Considerations

- Plan and conduct all management operations in or adjacent to wetlands in a manner that protects site productivity, maintains or enhances ecological functions, and protects water quality. Planning approaches that anticipate problems and incorporate protective measures will be less costly than remedial activities to mitigate impacts.
- Conduct silvicultural activities in wetlands when frozen or when firm enough to support the equipment being used.
- Plan for removal of equipment and cut material from the wetland area at the end of the winter season prior to thawing, or leave it until the next winter.

Forest Roads

Knowledge of water table position, zone of water flow, type of wetland soils, and the strength of wetland soils provides the basis for road construction techniques that maintain the flow of water through the road corridor and ensure the structural integrity of the road embankment. The concept is to provide a simple road structure of adequate strength to support heavy vehicle traffic while preventing subsurface soil displacement, and to provide either free-flowing pore space or drainage structures to pass water at its normal level through the road corridor.

- Avoid crossing wetlands. If wetlands must be crossed, then minimize the total wetland road mileage required to meet the landowner's objectives.
- Provide adequate cross-drainage by employing one or both of the following techniques: (1) use construction methods that allow free water flow throughout the entire roadbed, or (2) place culverts or other cross-drain structures at each end of each wetland crossing and at intermediate low points. Space culverts or other cross-drain structures at maximum 91 m intervals to ensure adequate cross-drainage through the roadbed.
- Construct all road embankment fills with clean fill or other suitable native materials. The road base is built wider and deeper than for upland roads to spread out the road loading and minimize failure.
- Install culverts in peatlands that are a minimum of 61 cm in diameter buried halfway below the soil surface. Their upper half will handle surface storm flows and the lower half will handle everyday subsurface flows. Failure to bury the

lower half of the culvert will cause subsurface water to pond on the “upstream” side of the road and kill trees.

- Place culverts at the low points of the wetland to pass surface water flows through the road embankments.
- Construct ditches in wetland crossings, where necessary, to intercept and carry surface and subsurface (top 30 cm) waters to, through, and away from the culverts. For shallow peat (cl. 2 m deep), ditches should be constructed immediately adjacent to the toe of the fill slope. For deep peat (21.2 m), maintain a separation between the toe of the embankment fill slope and the ditch that is at least three times the depth of the peat. This will minimize disturbance of the inherent strength of the top layer of peat containing the root mat.
- Design upland road approaches to wetlands so that surface runoff carrying potential sediment is diverted before entering the wetland.
- Anchor temporary structures at one end to allow the structure to move aside during high water flows.
- Remove temporary fills and structures to the extent practical when use is complete.
- Tramp and pack the wetland area wider than needed for the driving and working area if sufficient frost is not present. This additional space will allow for turnouts, snow removal, and parking.
- Cease equipment operations on any portion of frozen roads where rutting exceeds 15 cm in depth for continuous distances greater than 91 m. Resume operations only when conditions are adequate to support equipment. This will minimize blockage of cross-drainage and prevent down-road channelization.

Timber Harvesting

- Minimize rutting by conducting harvest activities in wetlands on firm or frozen ground that can support the equipment used.
- Move equipment to a stable portion or alter operating techniques to prevent repeated rutting of the harvest area deeper than 15 cm.
- Cease operations if no part of the site or no alternative techniques are available to prevent repeated rutting deeper than 6 in.
- Make reasonable efforts to remove slash or woody vegetation that originates from outside the wetland or from upland areas contained in the wetland. Slash or woody vegetation that originates from outside the wetland is considered till and must be removed.
- Avoid crossing small wetland inclusions, where practical.
- Size landings to the minimum required for the acres to be harvested, the equipment to be used, and the products to be cut.
- Locate landings on upland areas, whenever practical, when harvesting upland sites. When harvesting wetlands, an upland site may also be a preferred location for a landing.
- Avoid locating landings and yarding areas on frozen open water wetlands.
- Locate, design, construct, and maintain skid trails to minimize damage to the residual stand, minimize rutting, maintain surface and subsurface water flows in the wetland, and reduce erosion and sedimentation.
- Plan the layout of skid trails to maximize operating efficiency and minimize site disturbance.

lower half of the culvert will cause subsurface water to pond on the “upstream” side of the road and kill trees.

- Place culverts at the low points of the wetland to pass surface water flows through the road embankments.
- Construct ditches in wetland crossings, where necessary, to intercept and carry surface and subsurface (top 30 cm) waters to, through, and away from the culverts. For shallow peat (cl. 2 m deep), ditches should be constructed immediately adjacent to the toe of the fill slope. For deep peat (≥ 1.2 m), maintain a separation between the toe of the embankment fill slope and the ditch that is at least three times the depth of the peat. This will minimize disturbance of the inherent strength of the top layer of peat containing the root mat.
- Design upland road approaches to wetlands so that surface runoff carrying potential sediment is diverted before entering the wetland.
- Anchor temporary structures at one end to allow the structure to move aside during high water flows.
- Remove temporary fills and structures to the extent practical when use is complete.
- Tramp and pack the wetland area wider than needed for the driving and working area if sufficient frost is not present. This additional space will allow for turnouts, snow removal, and parking.
- Cease equipment operations on any portion of frozen roads where rutting exceeds 15 cm in depth for continuous distances greater than 91 m. Resume operations only when conditions are adequate to support equipment. This will minimize blockage of cross-drainage and prevent down-road channelization.

Timber Harvesting

- Minimize rutting by conducting harvest activities in wetlands on firm or frozen ground that can support the equipment used.
- Move equipment to a stable portion or alter operating techniques to prevent repeated rutting of the harvest area deeper than 15 cm.
- Cease operations if no part of the site or no alternative techniques are available to prevent repeated rutting deeper than 6 in.
- Make reasonable efforts to remove slash or woody vegetation that originates from outside the wetland or from upland areas contained in the wetland. Slash or woody vegetation that originates from outside the wetland is considered fill and must be removed.
- Avoid crossing small wetland inclusions, where practical.
- Size landings to the minimum required for the acres to be harvested, the equipment to be used, and the products to be cut.
- Locate landings on upland **areas**, whenever practical, when harvesting upland sites. When harvesting wetlands, an upland site may also be a preferred location for a landing.
- Avoid locating landings and yarding areas on frozen open water wetlands.
- Locate, design, construct, and maintain skid trails to minimize damage to the residual stand, minimize rutting, maintain surface and subsurface water flows in the wetland, and reduce erosion and sedimentation.
- Plan the layout of skid trails to maximize operating efficiency and minimize site disturbance.

reviews. Through affirmative management, education efforts, and technical assistance, the forestry community expects to achieve and demonstrate progressive improvement in the use of both water quality and wetland **BMPs**.

REFERENCES

- Boyette, W. G., Progress Report on Implementation of Silvicultural Nonpoint Source Programs in the United States, North Carolina Division of Forest Resources, Raleigh, NC, 1993.
- Curtis, J. G., Pelren, D. W., George, D. B., Adams, V. D., and Layzer, J. B., Effectiveness of Best Management Practices in Preventing Degradation of Streams Caused by Silvicultural Activities in **Pickett** State Forest, Tennessee, Report to the Tennessee Department of Conservation/Division of Forestry and the Tennessee Wildlife Resources Agency, Nashville, TN, 1990.
- Ellefson, P. V., Cheng, A. S., and Moulton, R. J., Regulation of Private Forestry Practices by State Governments, Station Bulletin **605**-1995. Minnesota Agricultural Experiment Station, University of Minnesota, St. Paul, MN, 1995.
- Floyd, D. W. and MacLeod, M. A., Regulation and perceived compliance: nonpoint pollution reduction programs in four states, *J. For.*, 91, 41, 1993.
- Lynch, J. A. and Corbett, E. S., Evaluation of best management practices for controlling nonpoint pollution from silvicultural operations, *Water Resources Bull.*, 26, 41, 1990.
- Minnesota Department of Natural Resources, Division of Waters, Protected Water Inventory Data Base, St. Paul, MN, 1984.
- Minnesota Department of Natural Resources, Division of Forestry, Protecting Water Quality and Wetlands in Forest Management, Best Management Practices in Minnesota, St. Paul, MN, 1995.
- Phillips, M. J., Rossman, R., and Dahlman, R., Best management practices for water quality, evaluating BMP compliance on forest lands in Minnesota: a three-year study, Minnesota Department of Natural Resources, Division of Forestry, St. Paul, MN, 1994.
- Siegel, W. C., Forestry implications of water quality and wetland law, in *Proc.: Agriculture Outlook '92: New Opportunities for Agriculture: 68th Ann. Outlook Conf.*, Washington, D.C., U.S. Department of Agriculture, December 3-5, 1991.
- Siegel, W. C. and Haines, T. K., State wetland protection legislation affecting forestry in the northeastern United States, *For. Ecol. Manage.*, **33/34**, 239, 1990.